CORNING GLASS WORKS
CORNING
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25X1

Enclosed are scanning electron photomicrographs of 3 lenticular samples:

1. POLY-104 is the polypropylene mold sent to Corning, N.Y.

2. EPOXY-105 is epoxy lenticules on substrate "n" (2.5-mil Estar® with clear gelatin backing).

3. EPOXY-106 is epoxy lenticules on substrate "b" (2-mil Mylar sheet, roughened -- one of the first castings tried. The two epoxy samples were thus made from different polypropylene molds.

Magnifications are indicated on photos and range from 53X to 3150X. White disks indicate dimensions in microns.

The samples were viewed at 0° (normal incidence), 45°, and 75°. At 0° the white disks give correct dimensions both along the lenticules and transverse to the lenticules. At 75° the white disks give the correct dimension transverse to the lenticules but not along the lenticules. Distances along the lenticules are about 4 times what they appear to be in the 75° photos. In the 45° photos distances along the lenticules are about 1.4 times what they appear to be.

We observe 4 kinds of defects in all three samples.

a. Undulations in lenticule height. This shows up in the 45° photos and very clearly in the 75° photos. See, e.g., I-A, D, F, H and III-D. Because of the 75° angle of observation, these undulations appear forshortened by a factor of 4 and are actually about 1 - 4 microns deep and occur approximately periodically at something like 12-micron intervals along all the lenticules. Such undulations could be caused by diamond chatter or vibration during the original ruling. However, note, especially

in I-D, corresponding undulations in adjacent lenticules. A milling operation, transverse to the grooves, performed on the aluminum grating blank before ruling could perhaps produce such an effect. We wonder whether the grating blank was optically flat.

b. Furrows along the lenticules. These show up especially in I-B, F, and II-A, E, F. It appears that inclusions in the grating blank were uprooted and dragged along by the diamond point. The aluminum master would then have an irregularly-shaped cavity at the end of a furrow. The first replication would have an irregular bump at the end of a reversed furrow. The polypropylene mold would then reproduce the original cavity and furrow. Finally, the epoxy lenticules would have a bump and reverse furrow. These furrows are 1 micron in width or less and 0.5 micron or less in depth. There are probably several in a square mm of area.

c. Bumps and holes caused by dirt on any of the masters before replication. Size is several microns and smaller. The epoxy-106 sample has many more of these than the other samples. (See III-A, E, F)

d. Scratches across lenticules. Photos II-A, B, C of Poly-104 show a transverse scratch which must have been made on the aluminum master or the polypropylene mold itself.

Polished sections were prepared and electron photomicrographs were made on the three samples, but we have not yet seen these photos.

Sincerely yours,

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